CENTRE NATIONAL D'ÉTUDES SPATIALES

Update of the French activities relevant to ILWS

Jean-Yves Prado, CNES

Status of CNES projects

- Antenna for STEREO SW Beacon should be available by end ‘07
- PICARD
  - Phase C/D in progress
  - Launch planned for 1st quarter 2009
- TARANIS
  - Phase B should start early ’07, pending a decision late ’06
  - Launch expected for 2011
- SMESE
  - Phase A started in march ’06, to be ended by april ’07
  - Decision expected by mid-’07
  - Launch objective 2011-2012

- ALL BASED ON MYRIADE PLATEFORMES

PICARD SCIENTIFIC PRODUCTS

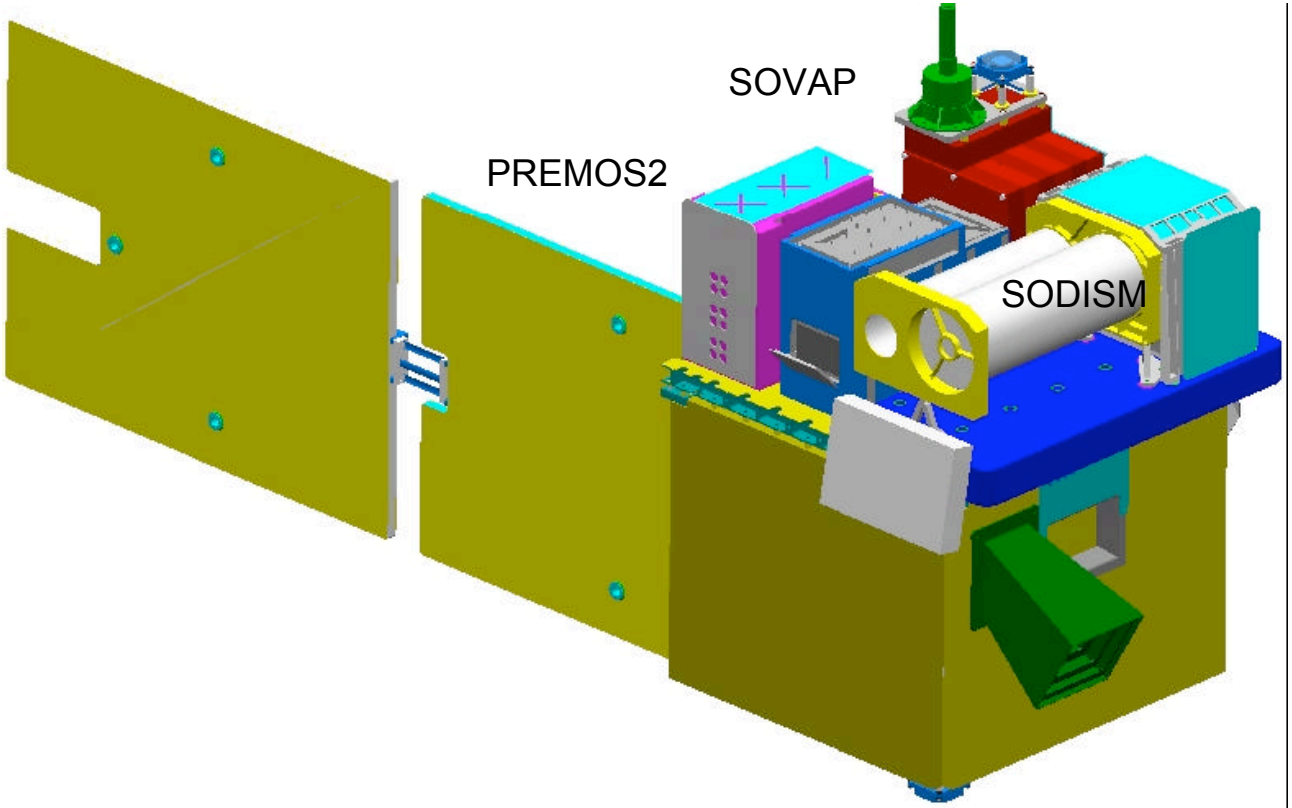
in orbit:

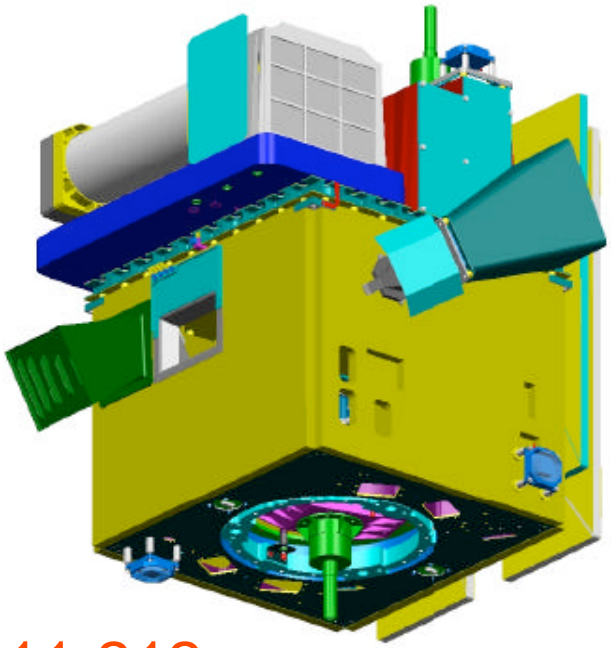
- Diameter, limb shape and asphericity in the continuum
- TSI (x2)
- 5 spectral channels (215,393, 535, 607, 782 nm)
- Activity (images at 215 nm and Ca II)=> space weather
- Solar oscillations

from the ground :

- diameter, limb shape and asphericity,
- local atmosphere turbulence

THE PICARD SPACECRAFT





Talk by G. Thuillier session E0.1 15.30 room 211-212

TARANIS OBJECTIVES

Description

- characterization of the sprites and associated emissions, measurements of their occurrence frequency and of their distribution at the scale of the earth. *(caméras, EM waves, X and γ spectra, high energy electrons)*
- study of the effects of the magnetic latitude and volcanic activity

Implied mechanisms

- determination of the nature of the triggering phenomena *(cosmic radiation)*
- determination of the source mechanisms *(EM waves, X and γ spectra, high energy electrons)*
- study of the nature of the explosive dissipation of energy in the ionosphere and magnetosphere *(EM waves, X and γ spectra, high energy electrons)*

Global impact

- determination of the effects on the upper atmosphere, ionosphere and magnetosphere *(EM waves, high energy electrons, associated ground based measurements, other satellites)*
- evaluation of the coupling atmosphere - ionosphere - magnetosphere and inter-planetary medium

TARANIS

- **Dedicated to understanding**

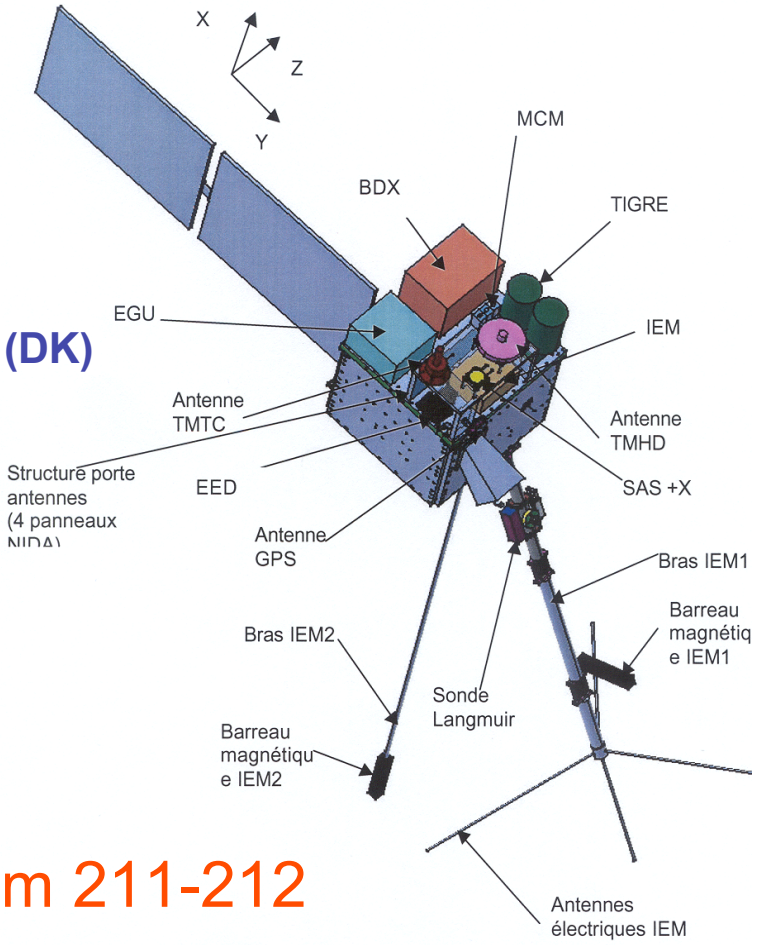
Atmosphere/ionosphere/magnetosphere coupling (sprites, elves, blue jets…)

Microcameras + photometer *-MCM-* **CEA (+JP)**

EM measurements *-IEM-* **LPCE (+PL,TCH)**

X-gamma Detector *-XGD-* **LANL (USA), DSRI (DK)**

Detector of high Energy Electrons **CESR (+TCH)**



- **Quasi Sun Synchronous Orbit (2hrs LT drift/year)**
- **Phase A ended in june**
- **Decision to proceed expected by end ’06**
- **Launch >2010**

Talk by E. Blanc session E0.1 15.55 room 211-212

MYRIADE SERIES

- More than 20 spacecraft based on the same bus and systems in flight or in preparation

60x60x50 cm bus

S-Band TTC (Kiruna/Toulouse)

Bus waiting row

MYRIADE CAPACITY

- Orbit inclination > 20°
- Altitude 600km< >1000km
- DNEPR launcher as the reference

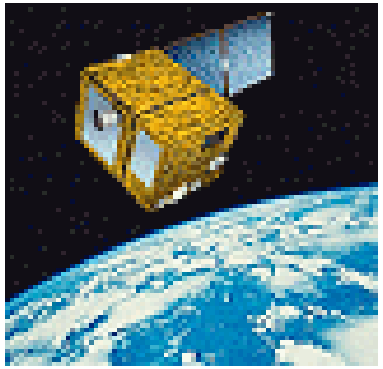
- Geocentric, inertial, solar or along the velocity vector pointing
- Pointing precision of 0.1 ° (actuation), 5.10^{-3}° (knowledge)
- Attitude control system in nominal mode uses a stellar sensor, four reaction wheels and three magnetic torquers

- up to 80 kg mass allocation to the P/L (when no propulsion/TM-X)
- Power available to the P/L > 60w (highly orbit dependant)
- Mass memory 16 Gbits
- S-Band 400 kb/s as baseline

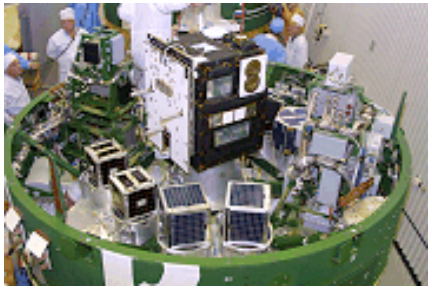
MYRIADE OPTIONS

- propulsion ΔV ~80 m/s (DEMETER, TARANIS…)
- X-Band telemetry (>a few Gbits/day)
  TM rate 16-50 Mb/s depending on the ground station G/T
- additional sun pointing device (PICARD, LYOT/SMESE)
- quick deorbit kit under study

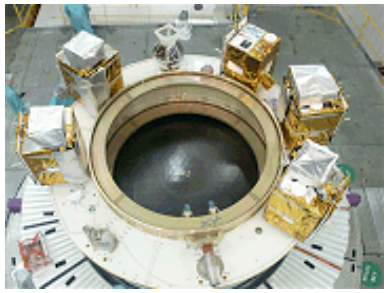
A few examples of the MYRIADE versatility



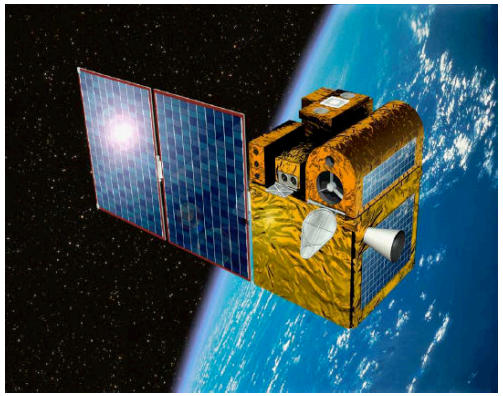
- DEMETER, TARANIS waves and particle instruments
- PARASOL Lidar for atmospheric science
- PICARD, SMESE Solar observation
- MICROSCOPE Fundamental physics
- ARGOS Localization
- ESSAIM, SPIRALE, ELINT Defense
- …
  - commercial availability of the bus (ASTRIUM, AAS)

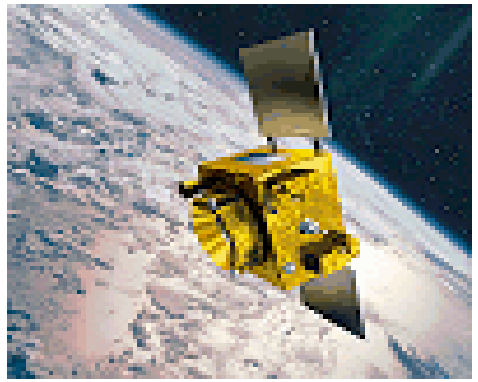


DNEPR launch



ARIANE 5 launch





FURTHER INTERNATIONAL COOPERATION

Earth Observation as a paradigm?

- **a unique object, many possible instruments**
- **curiosity driven science in competitition with monitoring science**
- **shift from mammoth s/c (ENVISAT…) to series of small specialized satellites**

A Solar Train?